Conference on ENVIRONMENTAL PROTECTION INDICATORS FOR CALIFORNIA

January 19, 2001

BREAK-OUT SESSION: SUGGESTIONS FOR POSSIBLE INDICATORS

Participants were organized into break-out groups, and asked to generate responses to the following question:

> *What environmental indicators could be used to quantitatively describe environmental issues?*

The ideas for possible environmental indicators generated by the break-out groups are listed below.

BREAK-OUT GROUP: AIR

OZONE DEPLETION

- Skin cancer
- UV radiation
- Emissions of ozone depleters

AMBIENT AIR QUALITY

- Air concentration
- Monitor diesel exhaust
- Emissions
- Asthma
- Lung cancer
- Criteria pollutants
- Toxic air contaminants
- Annual average cancer risk
- Hazard index for respiratory pollutants
- Vehicle miles traveled
- Alternatively fueled vehicles
- Fuel consumption data
- VOC ppm/cubic meter/per capita (population weighted by monitor)
- Cumulative impacts
- Combine economic and social and air data

INDOOR AIR

- Environmental tobacco smoke
- Emissions of combustion sources (e.g., NO_2, gas stoves, wood stoves)
- Off-gassing from materials

INDOOR AIR, (CONTINUED)

- Total VOC emissions (e.g., personal care products, cleaning chemicals)
- Air concentrations
- Off gassing from water
- Biological contaminants (e.g., dander, molds, mites)
- Pesticide use
- Market basket analysis
- Use of chemicals in schools
- Consumer use
- Aerosols times volatile organic compounds (VOC)
- Vehicle exhaust (e.g., car in garage)
- Radon
- Lead
- Asbestos

AESTHETICS

- Visibility

SURVEY OF AWARENESS

- Outreach efforts
- Public education
- Schools

CROSS-MEDIA POLLUTANTS

- Persistent organic pollutants (POPs)
- Environmental fate and transport
- Metals
- Pesticides
- Breast milk
- DNA adducts – (e.g., PAHs)

BREAK-OUT GROUP: LAND AND OTHER MEDIA

ENVIRONMENTAL QUALITY
- Noise pollution
- Pesticide use
- Health risks of naturally occurring substances
- Cross contamination into other media
- Electromagnetic fields and their health effects
- Inefficient use of water
- Environmental effects of mines

ECOLOGICAL IMPACTS
- Spread of exotic flora/fauna
- Biodiversity
- Ozone depletion/air quality
- Biogenetic engineered impacts on wildlands and crops
- Erosion

LAND AND OTHER MEDIA
- Land use
  - Low density development
  - Brownfield development
    - Number of Brownfields
    - Acres per year
    - Planning decisions
  - Reuse of old buildings
    - Construction and demolition (C & D)
  - Zoning and population density

WASTE DISPOSAL AND GENERATION
- Treatment
  - Loss of land to waste disposal
  - Illegal disposal of waste
  - Overpackaging of consumer goods
  - Releases and spills
  - Source reduction
  - Environmental performance of landfills (active/closed)
  - Waste treated by new technology
  - Medical waste treatment

RECYCLING AND REUSE
- Product reuse
- Environmental impacts of waste to energy
- Public health worker and recycling

WILDLIFE HABITAT

- Consumption of fuels
- Community based agriculture
- Conservation related to land use
- Impact of internet society on transportation

LAWS AND REGULATIONS

BREAK-OUT GROUP: WATER

Acres of wetlands
Toxicity
% Stream cover
Temperature
Lack of biological diversity
Distance of unaltered stream
Size and number of fish (and health of)
Riparian habitat: increase or decrease
Roads/stream crossings per unit area (forest areas)
Volume of runoff
    treated vs. untreated
    % imperviousness
Gallons of water recycled
No. of wells closed
No. of MCLs that are health-based
Taste/odor
Turbidity
Aquatic populations
No. of violations of aquatic standards
Health warnings
Salinity
Bottom-living organisms
Plants
WATER SUPPLY
    Water demand (gallons/capita)
    Wastewater flow
    Amount of water reclaimed (Goal #6)
    Cost of water for different uses (including subsidies) (Goal #6)
Goal 2
    Beach closures, postings (days/miles)
    Water bodies listed
    Compliance with MCLs
    No. of wells exceeding MCLs
    No. of microbiological contaminants
    % Private well with monitoring
Stream morphology
Dams, reservoirs, acres flooded
No. of aquifers restored
Area of fish/spawning habitat
Sediment grain size
Bed load movement
Beach erosion (replenishment as measure)
Clear-cutting/removal of riparian habitat
New water storage facilities

GROUNDWATER
- No. of pounds of MTBE removed per year
- Depth to groundwater
- Acre of ag/land use
- Amount of natural recharge area
- Ration of groundwater use to recharge
- Potential contamination activities in recharge area
- Local water need met by local production

IS IT SAFE?
- No. of septic tanks or cleanup sites in vicinity of drinking water wells
- No. of well closures
- Perception of dirty water (bottled water safer)

Decline of striped bass (fish population)
Tumors/lesions on fish
Acres of vernal pools
Annual salmon spawn
Acres of *Caulerpa* (algae)
No. of exotic species
% of ecosystem loss to exotics (zoo factor?)
Native species displaced
Endangered species
Frog (red-legged) decline
% Change from reference/baseline
Aesthetic conditions (trash, taste, odor)
Fish kills/beached whales
Spills (sewage, CSO, other)
Acres of kelp forest
No. of oiled birds
Algal blooms
Fish safe to eat? Health advisories, chemicals in fish tissue
Measures of urbanization
Miles of curb/gutter streets
Flow data
Precipitation
Shellfish bed closures
Natural flow or other
IBI
Measurements of chemicals in environment
Bioaccumulation: shellfish, fish
Tons of discharged pollutants
% Introduced water vs. natural (stream)
Frequency of floodplain inundation
Miles of navigable rivers ($ in commerce?)
Rafting, other recreational activities
No. and value of recreation days (beach use, fishing)

Dredging (see others for benthic, etc.)
    transportation
Fish landings
Reservoirs
    Sedimentation, release conflicts with environmental needs
Miles inundated/flooded by res. (=?)
Population growth
Unregulated contaminants/action levels
Waterfowl measurements
Pipeline, tank, transportation spills and overflows
No. of aquifers in overdraft
Subsidence
Movement of fresh-/saltwater interface in Delta
Sea level measures
Measure of migratory waterfowl (also recreation days)
Nesting/bag limits
Measure - caffeine, lab monitoring indicators (tracers)
Recreational use (boats in Delta)
Illness reports (bathers, surfers)
% impacted by legacy pollutants
Septic systems and water wells in vulnerable areas
New water right permits
Trends in size of groundwater plumes
Frequency and magnitude of toxicity in rivers and streams
No. of toxic hot spots
Miles of streams for spawning
No. of LUSTs
No. of replaced tanks (% of LUSTs)
No. exceeding PHGs

BREAK-OUT GROUP: HUMAN HEALTH

LEAD EXPOSURE- BLOOD LEAD LEVELS (> OR < 19 UG/DL)
- Childhood
- Adult/occupational

ASBESTOS EXPOSURE
- Incidence of mesothelioma
- Indoor air monitoring

UV EXPOSURE
- Incidence of skin cancer

BACTERIOLOGICAL-ASSOCIATED ILLNESS
- Food borne illness tracking.
- Beach closures

CHILDHOOD ILLNESS
- Number of days children absent from school
- Infant mortality
- Number of poisoning episodes

MEDIA-RELATED GENERATED RISKS

AIR TOXICS RISKS
- Using TRI data
- Air toxics monitoring

WATER RISKS
- Cancer and noncancer risks from water ingestion

WASTE RISKS

ASTHMA
- Hospitalizations
- ER visits
- Lung function tests

TOBACCO–RELATED DISEASES
- Monitor cardiovascular disease

AUTOIMMUNE DISEASE
- Incidence of lupus
- Exposure to cleaning products

PESTICIDE ILLNESS
- Occupational reports
- Accidental exposures

BIOMONITORING OF PERSISTENT ORGANIC CHEMICALS
- Blood levels
- Fat tissues
- Human milk

BIOMONITORING OF METALS
- Mercury in people
- Mercury in fish

NITRATES IN WATER

CAL. OCCUPATIONAL AND BEHAVIORAL BASELINE/ TOTAL EXPOSURE ASSESSMENT

RADIOLOGICAL EXPOSURE
- Occupational
- Indoor air
- Medical Procedures

CHILDHOOD DEVELOPMENTAL ISSUES
- Nitrates in water
- Precocious puberty
- Incidence of autism

REPRODUCTIVE HEALTH
- Exposure to known teratogens
- Miscarriages
- Infertility
- Birth defects monitoring

SICK BUILDING SYNDROME

INSURANCE REPORTS (POISONINGS?)

SENTINEL SPECIES AS BIOMONITORING TOOL

ENVIRONMENTAL EDUCATION
- Smoking Incidence
- Recycling
- Organic food consumption
- School gardens
- Community gardens
- Number of classes on the environment

ACCIDENTAL CHEMICAL RELEASES

- Number of releases
- Number of people getting shelter
- Number of lbs. of chemical released
- Number of illness reports

LINKING DISEASE WITH EXPOSURE

- Expanding diseases registries
- Linking existing registries

SKIN DISEASE AND INFECTIONS

- Incidence reports

SCHOOL HEALTH

- Lbs. of pesticides used
- Lead and asbestos abatement programs
- Number of schools with IPM program

FOOD SAFETY

- Number of acres of organic vs. nonorganic farms
- Number of acres farmland under IPM management

BREAK-OUT GROUP: ECOLOGICAL HEALTH

FOR LAND COVER:

Extent and type (acreage, suburban, ag land)
% of green space lost to urban development
type by classification system finer than broad categories (low intensity range)
conversion of ag land to what (urban or environmental use)
buffer areas
gains in recovered habitats
For land use

- By management status or protection level
- Productivity
- Biodiversity

ECOLOGICAL CAPITAL

Genetic diversity

- Loss of x, y. z
  - number of hatcheries
  - number of businesses doing genetic research near natural areas
  - changes in genetic markers in selected species over time
  - frequency of outlying populations (frequency of mutations)
  - risk monitoring

FOR BIODIVERSITY

Invasive species

- Distribution and abundance of invasive species
- % of native to non-native
- Number of species likely to be introduced

Number of types or area of ecosystems
counts of key species (e.g. benthic bioassessment)
index of biotic integrity
changes in time of invasive species
trends in numbers/population of species of special concern (a number of participants made the point that # endangered species added/removed from list was heavily political and a poor indicator of actual biodiversity health)